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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/667,964	09/21/2000	John Charles Dalrymple	8371-104	8324

46404 7590 03/17/2006

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EXAMINER	
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ART UNIT	PAPER NUMBER
2624	

DATE MAILED: 03/17/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/667,964	DALRYMPLE, JOHN CHARLES	
	Examiner	Art Unit	
	James A. Thompson	2625	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *12 January 2006*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☐ Claim(s) _____ is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *16 and 18-25* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *21 September 2000* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1)☒ Notice of References Cited (PTO-892)
2)☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3)☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4)☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5)☐ Notice of Informal Patent Application (PTO-152)
6)☐ Other: _____.

DETAILED ACTION

Response to Arguments

1. Applicant's arguments filed 12 January 2006 have been fully considered but they are not persuasive.

Regarding page 6, line 11 to page 8, line 5: While Examiner agrees with Applicant that the present amendments to the claims overcome the prior rejections set forth in the previous office action, dated 29 August 2005 and mailed 13 September 2005, additional prior art has been discovered which renders the present claims obvious to one of ordinary skill in the art at the time of the invention.

Furthermore, in response to Applicant's allegation that Arce (US Patent 6,493,112 B1) is not in the field of error diffusion, Applicant is respectfully reminded that it has been held that a prior art reference must either be in the field of applicant's endeavor or, if not, then be reasonably pertinent to the particular problem with which the applicant was concerned, in order to be relied upon as a basis for rejection of the claimed invention. See *In re Oetiker*, 977 F.2d 1443, 24 USPQ2d 1443 (Fed. Cir. 1992). In this case, Arce is concerned with using random noise generators to mitigate the effects of halftone image processing artifacts in digital image processing systems, which is clearly within the field of endeavor of the present application. By stating that Arce is not related to error diffusion, Applicant is attempting to artificially limit what is considered the same field of endeavor as the present application.

Regarding page 8, line 6 to page 9, line 21: As set forth in said previous office action, "Arce discloses controlling

random seed values such that the seed values are relatively large, likely to cause a dot to be printed, producing a set of selected seed values (figure 4(Step 1) and column 11, lines 44-48 of Arce). The white noise values are set based on the desired number of printed dots in a pixel array (figure 4(Step 1) and column 11, lines 44-48 of Arce)" [see page 3, lines 8-13 of said previous office action]. In other words, if a large number of printed dots are desired, the added white noise is adjusted accordingly. For a large number of print dots, the seed (white noise) values would have to be large. Otherwise, the resultant altered pixel values would not be large enough to trigger a corresponding large number of printed dots. Therefore, Arce teaches that the random seed values are controlled such that the seed values are relatively large, likely to cause a dot to be printed, producing a set of selected seed values.

Regarding page 9, line 22 to page 11, line 2: Again, Examiner agrees with Applicant that the present amendments to the claims overcome the prior art rejections set forth in said previous office action. However, additional prior art has been discovered which renders the present claims obvious to one of ordinary skill in the art at the time of the invention.

Regarding page 11, line 3 to page 12, line 12: Firstly, claim 24 has actually been rejected as being unpatentable over Mintzer in view of Klassen (US Patent 6,483,606 B1) and *obvious engineering design choice*. This is an important point that, with all respect, Applicant seems to have missed. Examiner has not argued that having the three random variable functions be 120 degrees out of phase with each other is explicitly taught in either Mintzer or Klassen. Rather, Examiner has argued that,

given the system already taught by Mintzer in view of Klassen, it would have been an obvious engineering design choice to set the three functions 120 degrees out of phase with each other. Furthermore, three functions that are mutually 120 degrees out of phase with each other do indeed balance out to zero. For example, in the newly added claim 25, three functions are given: $X_1 = \sqrt{-2\ln R_1}\cos(2\pi R_2)$, $X_2 = \sqrt{-2\ln R_1}\cos(2\pi(R_2 - 1/3))$, and $X_3 = \sqrt{-2\ln R_1}\cos(2\pi(R_2 + 1/3))$. Added together, $X_1 + X_2 + X_3$ results in $\sqrt{-2\ln R_1}(\cos(2\pi R_2) + \cos(2\pi(R_2 - 1/3)) + \cos(2\pi(R_2 + 1/3))) = 0$. The random numbers are R_1 and R_2, and are present in each of the equations for X_1, X_2 and X_3. The equations themselves are simply 120 degrees out of phase with each other and thus balance out to zero. While Applicant may have a particular intended purpose behind this balancing of error diffusion numbers, the balancing itself is nonetheless performed and serves the further purpose of maintaining numerical stability in error diffusion calculations. If the random number added to the error diffusion values do not balance out to zero, then numerical instability will occur since there will be a net addition or subtraction of the overall propagated value for each pixel that is processed.

Additionally, while other possible values for phase differences may be possible, this does not mean that one of ordinary skill in the art at the time of the invention would not have designed the system taught by Mintzer in view of Klassen with the random numbers of the three color planes set 120 degrees out of phase with each other. In fact, for three color planes each with the same magnitude of random numbers, setting each color plane 120 degrees out of phase with each other would

be the obvious way to maintain numerical stability in the computations.

Regarding page 12, lines 13-15: As stated above, the present amendments have overcome the prior art rejections presented in said previous office action. However, additional prior art has been discovered which renders the presently amended claims obvious to one of ordinary skill in the art at the time of the invention. The new grounds of rejection presented below have been necessitated by the present amendments to the claims.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. Claims 16 and 18-22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shiau (US Patent 5,880,857) in view of Mintzer (US Patent 5,210,602).

Regarding claim 16: Shiau discloses generating a set of random seed values from a random number generator (column 3, lines 62-66 of Shiau) for initializing the error values provided to the input image data (figure 7(S1-S2) and column 3, lines 58-60 of Shiau) and for use as initial error values (column 4, lines 29-38 of Shiau) when starting an error diffusion operation (column 4, lines 38-45 of Shiau); and adjusting each of the

random seed values from the random number generator (figure 17 and column 5, lines 40-49 of Shiau) such that the adjusted random seed values associated with the array of pixels are relatively large, likely to cause a dot to be printed, and increase the likelihood that dots will be printed sooner when a transition occurs between a zero image region and a nonzero image region (figure 17; and column 5, lines 15-19 and lines 50-54 of Shiau). The random noise generator generates a random number between negative 255 and positive 255 (column 5, lines 15-19 of Shiau). For gray values, particularly gray values near the peaks of the noise amplitude distribution (figure 17 of Shiau), the noise amplitude multiplied by the generated random number (column 5, lines 50-54 of Shiau) will be relatively large, likely to cause a dot to be printed, and increase the likelihood that dots will be printed sooner when a transition occurs between a zero image region and a nonzero image region. For example, for a gray level value of 128, the noise amplitude is 0.375. Thus, the random number can be between negative 96 and positive 96, which greatly increases the likelihood of a printed dot. Furthermore, the specific noise amplitude distribution shown in figure 17 of Shiau does not have to be strictly adhered to. Different distributions can also be used based on the type of printing device used (column 45-49 of Shiau).

Shiau further discloses initializing the error values associated with the array of pixels with the set of adjusted random seed values (column 4, lines 29-38 of Shiau) prior to starting the error diffusion operation (column 4, lines 38-45 of Shiau) for reducing startup transients during the error

diffusion operation (figure 12; figure 13; and column 7, lines 19-25 and lines 39-44 of Shiau).

Shiau does not disclose expressly that said random seed values are generated for initializing the error buffers; and that said initializing is specifically performed on the error buffers rather than the initial error values.

Mintzer discloses generating random seed values specifically for an error buffer (figure 3(coefficient store) and column 7, lines 31-41 of Mintzer).

Shiau and Mintzer are combinable because they are from the same field of endeavor, namely the generation of random noise for error diffusion processing of digital image data. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to produce random number values for the quantization errors, as taught by Mintzer, rather than the input image data, as taught by Shiau. Thus, the initializing taught by Shiau would be specifically performed on the error buffers taught by Mintzer rather than the initial error values as taught by Shiau. The suggestion for doing so would have been that, in error diffusion, the quantization error is added to the image data and the thus modified image data is compared with a threshold value. Whether the added random number is added directly to the image data as a random number, as taught by Shiau, or as an initial error value, such as the error value taught by Mintzer, the result is the same. In both cases, the image data will have a random number added which will then be compared with a threshold value. If the random number is added as part of the error diffusion process, then the error buffer would be initialized with the random number rather than zero.

Therefore, it would have been obvious to combine Mintzer with Shiau to obtain the invention as specified in claim 16.

Regarding claim 18: Shiau discloses generating a first set of random seed values (column 3, lines 62-66 of Shiau) used as initial error values (column 4, lines 29-38 of Shiau) for starting an error diffusion process for a first color plane (column 4, lines 38-45 of Shiau); and adjusting each of the random seed values from the random number generator (figure 17 and column 5, lines 40-49 of Shiau) such that all of the adjusted random seed values are relatively large to increase the likelihood that dots will be printed sooner when a transition occurs between a zero image region and a nonzero image region (figure 17; and column 5, lines 15-19 and lines 50-54 of Shiau). The random noise generator generates a random number between negative 255 and positive 255 (column 5, lines 15-19 of Shiau). For gray values, particularly gray values near the peaks of the noise amplitude distribution (figure 17 of Shiau), the noise amplitude multiplied by the generated random number (column 5, lines 50-54 of Shiau) will be relatively large to increase the likelihood that dots will be printed sooner when a transition occurs between a zero image region and a nonzero image region. For example, for a gray level value of 128, the noise amplitude is 0.375. Thus, the random number can be between negative 96 and positive 96, which greatly increases the likelihood of a printed dot. Furthermore, the specific noise amplitude distribution shown in figure 17 of Shiau does not have to be strictly adhered to. Different distributions can also be used based on the type of printing device used (column 45-49 of Shiau).

Shiau further discloses populating buffers (which store the error values) with the set of random seed values (column 4, lines 29-38 of Shiau) prior to starting the error diffusion operation (column 4, lines 38-45 of Shiau) for reducing startup transients during the error diffusion operation (figure 12; figure 13; and column 7, lines 19-25 and lines 39-44 of Shiau).

Shiau does not disclose expressly generating a second set of random seed values so as to negatively correlate the second set of random seed values with the first set of random seed values for a second color plane; generating a third set of random seed values for a third color plane; that said steps of adjusting and populating are performed for each of the first, second and third color planes; and that said step of populating is performed specifically with respect to error buffers.

Mintzer discloses performing error diffusion for each of a first, second and third color plane (figure 1c and column 4, lines 38-48 of Mintzer); generating a first set of random seed values for a first color plane (figure 2a($c_{r,s}^{c1}$); figure 3(random number generator); and column 7, lines 32-42 of Mintzer); generating a second set of random seed values (figure 2b($c_{r,s}^{c2}$); figure 3(random number generator); and column 7, lines 32-42 of Mintzer) so as to negatively correlate the second set of random seed values with the first set of random seed values for a second color plane (column 7, lines 14-26 of Mintzer); generating a third set of random seed values for a third color plane (figure 2c($c_{r,s}^{c3}$); figure 3(random number generator); and column 7, lines 32-42 of Mintzer); and populating three error buffers with the sets of seed values (figure 3(constant store) and column 7, lines 36-41 of Mintzer). The color-coupled error

diffusion is performed for the red color plane so as to minimize the difference between the green and red input values and the green and red output values (column 7, lines 14-26 of Mintzer). Thus, the set of random seed values for the red color plane is negatively correlated with the set of random seed values for the green color plane since, if the green input is too high, then the red input must be correspondingly low in order to minimize the difference between the combination red and green input and the combination red and green output.

Shiau and Mintzer are combinable because they are from the same field of endeavor, namely the generation of random noise for error diffusion processing of digital image data. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to generate a first, second and third set of random seed values for a first, second and third color plane, respectively, and perform error diffusion for the three color planes, wherein the random seed values of the second color plane negatively correlate with the random seed values of the first color plane as taught by Mintzer. Thus, the populating and adjusting steps would also be performed for each of the first, second and third color planes. The motivation for doing so would have been to provide an improved color reproduction in a color output system (column 3, lines 7-12 of Mintzer). Further, it would have been obvious to a person of ordinary skill in the art at the time of the invention to specifically populate the error buffers with the random sets of seed values, as taught by Mintzer. The suggestion for doing so would have been that, in error diffusion, the quantization error is added to the image data and the thus modified image data is compared with a threshold value. Whether the added random number is

added directly to the image data as a random number, as taught by Shiau, or as an initial error value, such as the error value taught by Mintzer, the result is the same. In both cases, the image data will have a random number added which will then be compared with a threshold value. If the random number is added as part of the error diffusion process, then the error buffer would be initialized with the random number rather than zero. Therefore, it would have been obvious to combine Mintzer with Shiau to obtain the invention as specified in claim 18.

Regarding claim 19: Shiau discloses generating at least one set of seed values from a first constant (figure 17 and column 5, lines 41-49 of Shiau).

Further regarding claim 20: Mintzer discloses generating a second set of seed values from a second constant (figure 2b($c_{r,s}^{c2}$); figure 3(random number generator); and column 7, lines 32-42 of Mintzer) and then altering the seed values to negatively correlate to the first set (column 7, lines 14-26 of Mintzer). As set forth above, the color-coupled error diffusion is performed for the red color plane so as to minimize the difference between the green and red input values and the green and red output values (column 7, lines 14-26 of Mintzer). Thus, the set of seed values for the red color plane is negatively correlated with the set of seed values for the green color plane since, if the green input is too high, then the red input must be correspondingly low in order to minimize the difference between the combination red and green input and the combination red and green output.

Further regarding claim 21: Mintzer discloses generating a third set of seed values from a third constant (figure 2c($c_{r,s}^{c3}$) of

Mintzer) different from the first and second constants (figure 3 (random number generator); and column 7, lines 32-42 of Mintzer).

Regarding claim 22: Shiau does not disclose expressly performing a negative correlation from the first set of seed values to form the second set of seed values.

Mintzer discloses performing a negative correlation from the first set of seed values to form the second set of seed values (column 7, lines 14-26 of Mintzer). The color-coupled error diffusion is performed for the red color plane so as to minimize the difference between the green and red input values and the green and red output values (column 7, lines 14-26 of Mintzer). Thus, the set of random seed values for the red color plane is negatively correlated with the set of random seed values for the green color plane since, if the green input is too high, then the red input must be correspondingly low in order to minimize the difference between the combination red and green input and the combination red and green output.

Shiau and Mintzer are combinable because they are from the same field of endeavor, namely the generation of random noise for error diffusion processing of digital image data. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to perform error diffusion for the three color planes, wherein the random seed values of the second color plane negatively correlate with the random seed values of the first color plane as taught by Mintzer. The motivation for doing so would have been to provide an improved color reproduction in a color output system (column 3, lines 7-12 of Mintzer). Therefore, it would have been obvious to combine

Mintzer with Shiau to obtain the invention as specified in claim 22.

4. Claim 23 is rejected under 35 U.S.C. 103(a) as being unpatentable over Shiau (US Patent 5,880,857) in view of Mintzer (US Patent 5,210,602) and obvious engineering design choice.

Regarding claim 23: Mintzer discloses performing a negative correlation from the first set of seed values to form the second set of seed values, as discussed in the arguments regarding claim 22 presented above.

Shiau in view of Mintzer does not disclose expressly multiplying the first set of seed values by a negative number to form the second set of seed values.

However, it would have been an obvious engineering design choice for one of ordinary skill in the art at the time of the invention to multiply the first set of seed values by a negative number to form the second set of seed values, thus negatively correlating the first set of seed values with the second set of seed values. The motivation for doing so would have been that multiplying by a negative number is computationally simple and requires the least cpu time compared with operations such as multiplication or division. Furthermore, simply using the negative values of the first set of seed values as the second set of seed values will help to minimize the difference between the combination of green and red input values and the combination of green and red output values (column 7, lines 22-26 of Mintzer). Thus, it would have been obvious to one of ordinary skill in the art at the time of the invention to modify the system of Shiau in view of Mintzer in the above obvious manner to obtain the invention as specified in claim 23.

5. Claim 24 is rejected under 35 U.S.C. 103(a) as being unpatentable over Shiau (US Patent 5,880,857) in view of Mintzer (US Patent 5,210,602) and Levien (US Patent 5,276,535).

Regarding claim 24: Shiau discloses generating two numbers from a random number generator (column 3, lines 62-66 of Shiau); generating a first distribution variable from the two numbers (figure 17 and column 5, lines 40-49 of Shiau); generating a first set of seed values (column 3, lines 62-66 of Shiau) from the first distribution variable (column 5, lines 62-66 of Shiau) for use as initial error values (column 4, lines 29-38 of Shiau) for starting up an error diffusion process (column 4, lines 38-45 of Shiau); and initializing the error values with the first set of selected seed values (column 4, lines 29-38 of Shiau) prior to starting the error diffusion operation (column 4, lines 38-45 of Shiau).

Shiau does not disclose expressly that said first distribution variable is specifically a normally distributed variable; generating a second normally distributed variable from the two random numbers that is negatively correlated with the first normally distributed variable; generating a second set of seed values for using as initial error values for starting up the error diffusion process from the second normally distributed variable; generating a third normally distributed variable from the two random numbers that is negatively correlated with the first normally distributed variable and the second normally distributed variable; generating a third set of seed values for using as initial error values for starting up the error diffusion process from the third normally distributed variable; that said initializing is performed with respect to the first, second and third set of selected seed values; and that said

initializing is specifically performed with respect to error buffers.

Mintzer discloses performing error diffusion for each of a first, second and third color plane (figure 1c and column 4, lines 38-48 of Mintzer); generating a first set of seed values for a first color plane (figure 2a($c^{c1}_{r,s}$); figure 3(random number generator); and column 7, lines 32-42 of Mintzer); generating a second set of seed values (figure 2b($c^{c2}_{r,s}$); figure 3(random number generator); and column 7, lines 32-42 of Mintzer) that is negatively correlated with the first normally distributed variable (column 7, lines 13-26 of Mintzer); and generating a third set of seed values (figure 2c($c^{c3}_{r,s}$); figure 3(random number generator); and column 7, lines 32-42 of Mintzer) that is negatively correlated with the first set of seed values and the second set of seed values (column 7, lines 26-30 of Mintzer). The color-coupled error diffusion is performed for the red color plane so as to minimize the difference between the green and red input values and the green and red output values (column 7, lines 14-26 of Mintzer) and for the blue color plane so as to minimize the difference between the sum of green, red and blue inputs and the sum of green, red and blue outputs (column 7, lines 26-30 of Mintzer). Thus, the set of random seed values for the red color plane is negatively correlated with the set of random seed values for the green color plane since, if the green input is too high, then the red input must be correspondingly low in order to minimize the difference between the combination red and green input and the combination red and green output. Furthermore, the set of random seed values for the blue color plane is negatively correlated with the green color plane and

the red color plane since, if the combination of green and red input is too high, then the blue input must be correspondingly low in order to minimize the difference between the sum of green, red and blue inputs and the sum of green, red and blue outputs.

Mintzer further discloses generating the seed values specifically for an error buffer (figure 3(coefficient store) and column 7, lines 31-41 of Mintzer).

Shiau and Mintzer are combinable because they are from the same field of endeavor, namely the generation of random noise for error diffusion processing of digital image data. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to generate a first, second and third set of random seed values for a first, second and third color plane, respectively, wherein the second set of random seed values is negatively correlated with the first set of random seed values and the third set of random seed values is negatively correlated with the first and second sets of random seed values, and perform error diffusion for the three color planes, as taught by Mintzer. Thus, the operations performed for the first distribution variable and the first set of seed values would be performed for a second and third distribution variable and a second and third set of seed values. Therefore, by combination, Shiau in view of Mintzer teaches generating a second distribution variable from the two random numbers that is negatively correlated with the first distribution variable; generating a second set of seed values for using as initial error values for starting up the error diffusion process from the second distribution variable; generating a third distribution variable from the two random numbers that is

negatively correlated with the first distribution variable and the second distribution variable; generating a third set of seed values for using as initial error values for starting up the error diffusion process from the third distribution variable; and that said initializing is performed with respect to the first, second and third set of selected seed values. The motivation for doing so would have been to provide an improved color reproduction in a color output system (column 3, lines 7-12 of Mintzer). Further, it would have been obvious to a person of ordinary skill in the art at the time of the invention to specifically initialize error buffers with the random sets of seed values, as taught by Mintzer. The suggestion for doing so would have been that, in error diffusion, the quantization error is added to the image data and the thus modified image data is compared with a threshold value. Whether the added random number is added directly to the image data as a random number, as taught by Shiau, or as an initial error value, such as the error value taught by Mintzer, the result is the same. In both cases, the image data will have a random number added which will then be compared with a threshold value. If the random number is added as part of the error diffusion process, then the error buffer would be initialized with the random number rather than zero. Therefore, it would have been obvious to combine Mintzer with Shiau.

Shiau in view of Mintzer does not disclose expressly that said first distribution variable is specifically a normally distributed variable; that said second distribution variable is specifically a normally distributed variable; and that said third distribution variable is specifically a normally distributed variable.

Levien discloses performing error diffusion using a Gaussian (normal) distribution function (column 9, lines 21-27 of Levien).

Shiau in view of Mintzer is combinable with Levien because they are from the same field of endeavor, namely error diffusion processing of digital image data. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to specifically use a Gaussian distribution (which is also a normal distribution) for the first, second and third distribution variables. Thus, the first, second and third distribution variables are specifically first, second and third normally distributed variables. The suggestion for doing so would have been that a Gaussian distribution is isotropic, and therefore error diffusion is performed in the same manner without respect to the direction of error diffusion (column 9, lines 21-27 of Levien). This is advantageous since using a Gaussian distribution thus prevents the rightward diffusion of errors from being biased over the downward diffusion of errors, and likewise for any other direction in which error diffusion is performed. Therefore, it would have been obvious to combine Levien with Shiau in view of Mintzer to obtain the invention as specified in claim 24.

6. Claim 25 is rejected under 35 U.S.C. 103(a) as being unpatentable over Shiau (US Patent 5,880,857) in view of Mintzer (US Patent 5,210,602), Levien (US Patent 5,276,535) and obvious engineering design choice.

Regarding claim 25: As set forth above in the arguments regarding claim 24, Shiau in view of Mintzer and Levien teach that the second normally distributed variable is negatively

correlated with the first normally distributed variable; and the third normally distributed variable is negatively correlated with the first normally distributed variable and the second normally distributed variable. However, Shiau in view of Mintzer and Levien does not disclose expressly that the first normally distributed variable is generated according to $X_1 = \sqrt{-2\ln R_1}\cos(2\pi R_2)$; the second normally distributed variable is generated according to $X_2 = \sqrt{-2\ln R_1}\cos(2\pi(R_2 - 1/3))$, and the third normally distributed variable is generated according to $X_3 = \sqrt{-2\ln R_1}\cos(2\pi(R_2 + 1/3))$.

However, it would have been an obvious engineering design choice for one of ordinary skill in the art at the time of the invention to generate the first normally distributed variable according to $X_1 = \sqrt{-2\ln R_1}\cos(2\pi R_2)$; generate the second normally distributed variable according to $X_2 = \sqrt{-2\ln R_1}\cos(2\pi(R_2 - 1/3))$, and generate the third normally distributed variable according to $X_3 = \sqrt{-2\ln R_1}\cos(2\pi(R_2 + 1/3))$. As set forth above in the arguments regarding claim 24, Mintzer teaches that the second set of seed values is negatively correlated with the first set of seed values; and the third set of seed values is negatively correlated with the first set of seed values and the second set of seed values. The phase values for the first (0 radians), second (-π/3 radians), and third (π/3 radians) functions are offset from each other so that $X_1 + X_2 + X_3$ results in $\sqrt{-2\ln R_1}\left(\cos(2\pi R_2) + \cos(2\pi(R_2 - 1/3)) + \cos(2\pi(R_2 + 1/3))\right) = 0$, which clearly demonstrates that the second set of seed values is negatively correlated with the first set of seed values and the third set of seed values is negatively correlated with the first set of

seed values and the second set of seed values. The value $\sqrt{-2\ln R_1}$, which is the magnitude for X_1, X_2 and X_3, is the same and is one of many possible values that can be set for a particular peak in a normal distribution.

Thus, while the specific equations for X_1, X_2 and X_3 have not been explicitly set forth by Shiau, Mintzer or Levien, setting the random seed values to said equations is simply one of the many possibilities by which one of ordinary skill in the art at the time of the invention would practice the system set forth by Shiau in view of Mintzer and Levien, and thus a part of the practical implementation of said system. The motivation one of ordinary skill in the art at the time of the invention would have had to use said specific equations would have been to establish a particular normal distribution, thus providing an isotropic distribution, allowing error diffusion to be performed in the same manner without respect to the direction of error diffusion (column 9, lines 21-27 of Levien); and to negatively correlate the three color planes, thus providing an improved color reproduction in a color output system (column 3, lines 7-12 of Mintzer). Thus, it would have been obvious to one of ordinary skill in the art at the time of the invention to modify the system of Shiau in view of Mintzer and Levien in the above obvious manner to obtain the invention as specified in claim 25.

Conclusion

7. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL.** See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to James A. Thompson whose telephone number is 571-272-7441. The examiner can normally be reached on 8:30AM-5:00PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David K. Moore can be reached on 571-272-7437. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

James A. Thompson
Examiner
Division 2625

13 March 2006

David Moore

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SUPERVISORY PATENT EXAMINER
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